"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

SOV/137-59-1-111

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 16 (USSR)

AUTHOR: Rayevskiy, S. Ya.

TITLE: A Complete "Frequency" Description of Stochastic Processes and Certain Problems of the Quality of Control Systems (Polnoye "chastotnoye" opisaniye sluchaynykh protsessov i nekotoryye voprosy kachestva sistem regulirovaniya)

PERIODICAL: V sb.: Avtomat. upravleniye i vychisl. tekhn. Nr 1. Moscow, Mashgiz, 1958, pp 80-99

ABSTRACT: The author proposes to characterize a certain stochastic process by static characteristics (SC) of a complex random function $\dot{C}(j\omega)$ which is a spectrum (Fourier representation) in relation to a random function of time X(t), and not by distribution functions or moments of X(t). A comparison is made between the "time" and "frequency" description using stochastic processes as an example. To realize either of these the fulfillment of the Dirichlet conditions and the absolute integrability in the time interval (-T, +T) for which these stochastic processes are given should take place. The author examines certain SC of the random spectra, the quality of the servo

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A Complete "Frequency" Description of Stochastic Processes (cont.)

systems with continuous random input actions, and the criterion of the minimum of the mean-square time error. It is noted that the complete "frequency" description of stochastic processes proposed for the analysis of linear systems to which continuous random input actions are applied has an advantage over the "time" description, because the latter does not produce such simple expressions for the SC at the output end of the system in terms of the SC of the input action. It is assumed that in other linear problems of automatic control and electronics engineering the "frequency" description will also be useful.

A. S.

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

SOV-107-3-4-6/28

AUTHORS: Rayevskiy, S. Ya. and Khokhlov, R. V.

TITLE: Synchronisation of an Oscillator by a Sinusoidal Signal in the Presence of the Fluctuation Noise (O sinkhronizatsii avtogeneratora sinusoidal'noy siloy pri nalichii fluktuatsionnykh pomekh)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 4, pp 507-511 (USSR)

ABSTRACT: The problem is formulated as follows: an oscillator is subjected to the action of an external sinusoidal signal mixed with a random noise which can be regarded as a stationary random process. The oscillator is assumed to have a high quality resonant circuit, so that its bandwidth is expressed by:

$$\Omega = \frac{\omega}{Q} \qquad (1)$$

, where Q is the quality factor of the system and ω is the oscillation frequency. The synchronising voltage can be expressed by Eq.(2) in which E_0 and p are the amplitude and the

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Synchronisation of an Oscillator by a Sinusoidal Signal in the Presence of the Fluctuation Noise

frequency of the external signal respectively and e_1 and e_2 are two comparatively slowly changing random functions. The basic equation of the system is given by Eq.(3). If it is assumed that the oscillator is of the tuned-grid type and that the oscillation voltage is expressed by Eq.(4), the synchronisation can be described by Eqs.(5) where A and φ are the amplitude and the phase of the oscillations and $\Delta = \omega - p$ is the detuning of the system. If the amplitude of the external signal is small, the oscillation amplitude can be expressed by Eq.(6) in which μ is a small parameter. Consequently, the amplitude deviation of the system can be described by Eq.(7). For $\sin\varphi \simeq \varphi$ and $\cos\varphi \simeq 1$, the phase equation of the system can be written as Eq.(9) and its steady state solution as Eq.(10). The integral given by Eq.(10) can approximately be written as Eq.(11) in which the second term is expressed by Eq.(12). The above approximation is true for $z_0 \ll 1$; this condition can also be written as Eq.(14), in which N is the spectral density of the random signal in the bandwidth Ω. Eq.(14) is the necessary and sufficient condition for the synchronisation

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Synchronisation of an Oscillator by a Sinusoidal Signal in the Presence of the Fluctuation Noise

of the system, that is, for ensuring that the amplitude and phase deviations are small. If this condition is not fulfilled, there is no synchronisation, or the synchronisation becomes spurious. There are 2 figures, 3 Soviet references and 1 English.

SUBMITTED: November 23, 1956

1. Oscillators--Synchronization 2. Mathematics--Applications

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

24(3),9(4)

AUTHOR: Ravevskiy,S.Ya. SOV/55-58-4-15/31

TITLE: On the Question of the Building-up Process of the Amplitude of Stationary Permanent Oscillations in an Autogenerator for Fluctuations (K voprosu ob ustanovlenii amplitudy statsionarnykh avtokolebaniy v avtogeneratore pri nalichii fluktuatsiy)

PERIODICAL: Vestnik Moskovskogo universiteta, Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1958, Nr 4, pp 137-142 (USSR)

ABSTRACT: Let the tension in the grid of the autogenerator tube according to Teodorchik [Ref 4] be described by

$$\ddot{x} + 2(\quad_0 - \quad_2 x^2)\dot{x} + \quad^2 x = \quad^2 E \ ,$$

where E is generated by "broken" fluctuations (compare [Ref 3])

$$E(t) = e_1(t)\cos \quad t + \quad(t) \quad + e_2(t)\sin \quad t + \quad (t) \quad ,$$

where $e_1(t)$, $e_2(t)$, (t) are slowly variable random functions. With the aid of statistical averages the author determines the

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

On the Question of the Building-up Process of the Amplitude of Stationary Permanent Oscillations in an Autogenerator for Fluctuations

SOV/59-58-4-15/31

time in which the amplitude A(t) of the permanent oscillations $x = A(t)\cos \quad t + \quad (t)$ assumes a sufficiently constant value. An intermediate result is compared with a paper of I.L.Bershteyn and S.M.Rytov [Ref 3]. There is 1 figure, and 4 Soviet references.

ASSOCIATION: Kafedra radiotekhniki (Chair of Radio [illegible])

SUBMITTED: October 8, 1957

Card 2/2

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

KHARKEVICH, Aleksandr Aleksandrovich, red.; RAYEVSKIY, S.Ya., red.; AKHLAMOV, S.N., tekhn.red.

[Information theory and its applications; collection of translations from the English] Teoriia informatsii i ee prilozheniia; sbornik perevodov. Pod red. Kharkevicha. Moskva, Gos.izd-vo fiziko-matem.lit-ry, 1959. 328 p. (MIRA 12:12)
(Information theory)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

.AYEVSKIY, S.Ya.

Establishing the amplitude of self-oscillations in the case of slow fluctuations. Vest. Mosk. un. Ser. 3: Fiz., astron. 15 no.5:28-35 S-O '60. (MIA 14:2)

1. Moskovskiy gosudarstvenny universitet, kafedra teorii kolebaniy.
(Oscillations)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, S. YA

PHASE I BOOK EXPLOITATION SOV/5856

Tsenov, Yuriy Petrovich, Sergey Yakovlevich Rayevskiy, and Naum Samoylovich Raybman

Pomoshchnik avtomatiki; statisticheskaya dinamika v avtomatike (Aid in Automation; Statistical Dynamics in Automation) Moscow, Izd-vo AN SSSR, 1961. 116 p. (Series: Akademiya nauk SSSR. Nauchno-populyarnaya seriya). 8000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR.

Ed. of Publishing House: Ye. I. Levit; Tech. Ed.: O. M. Gus'kova.

PURPOSE : This book is intended for students, engineers, technicians, and those interested in the application of statistical methods to automatic control.

COVERAGE: Fundamental concepts of probability and information theory and examples of their application in science and technology are presented. Control systems which are optimal in a statistical

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sense are discussed, along with the construction of mathematical analogs for relationships between various quantities. Ways of using statistical methods for the investigation of control systems are indicated. The application of statistical methods for analyzing and evaluating the accuracy of individual automated processes is described. No personalities are mentioned. There are 12 references, all Soviet (including 2 translations).

TABLE OF CONTENTS:

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AVAILABLE: Library of Congress

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

31265
S/103/61/022/011/005/014
D201/D306

16,4000 (1329, 1344, 1031)

AUTHORS: Rayevskiy, S. Ya., and Raybman, N. S. (Moscow)

TITLE: Applying statistical dynamics methods to designing characteristics of some automation objects

PERIODICAL: Avtomatika i telemekhanika, v. 22, no. 11, 1961, 1466-1474

TEXT: In the present article the authors consider the general problems of the theory of determining characteristics of the object to be controlled. This theory is then explicitly considered as applied to a certain class of technological processes and finally applied for determining one of the characteristics of automatic bearing production lines. Let the input to the controlled object be a certain random process X(t) resulting in a random process Y(t) at the output. X(t) and Y(t) can be measured, the results of their measurements determining the object characteristic, which is defined as a certain operator. Hence

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

Applying statistical dynamics ...

$$A_t X(\varsigma) = Y(t) \qquad (1.1)$$

where A_t is the object operator, the subscript t indicating that the operator depends on the variable t. Since no data are assumed known about the operator, it is assumed to be random and hence it is enough to determine its sample value A_t^* . The sample operator determines the operator A_t if its value is near to the real value of the operator itself, this value being determined from a certain criterium, which condition is equivalent to the requirement that a random function

$$Y^*(t) = A_t^* X(s) \qquad (1.2)$$

be nearly equal to the random function Y(t). Such problems are solved in statistical dynamics by V. S. Pugachev (Ref. 1: Teoriya

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sluchaynykh funktsiy i yeye primeniye k zadacham avtomaticheskogo upravleniya (Theory of Random Functions and its Application to the Problems of Automatic Control), Fizmatgiz, 1960) by the construction, according to the chosen criterium, of a certain function $\rho\left[Y(t), Y^{*}(t)\right]$ depending on $Y(t)$ and $Y^{*}(t)$, the mathematical expectation of which is made minimum, i.e.

$$M\rho\left[Y(t), Y^{*}(t)\right] = \min \qquad (1.3)$$

A typical object in practice is a technological chain of consecutive operations in machine engineering, instrument production, merallurgy etc. or an automatic production line. Let such a chain have n series connected units, having a certain random factor $X_0(t)$ affecting the input of the first unit. $X_0(t)$ will result in a factor $X_1(t)$ at the input of the second unit, $X_1(t)$ will result in an $X_2(t)$ at the input of the third unit etc. Hence

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Applying statistical dynamics ...

$$D\left[X_n(t)\right] = D\left[A^*_{tk}X_{k-1}(s)\right] + D\left[\varepsilon_k(t)\right] \quad (k=1,2,\ldots,n-1,n) \tag{2.2}$$

may be obtained from which

$$\sigma_n^2 = \sum_{k=1}^{n} D_k\left[X_n(t)\right] = \sum_{k=1}^{n} D\left[A^*_{tk}X_{k-1}(s)\right] + \sum_{k=1}^{n} D\left[\varepsilon_k(t)\right] \tag{2.3}$$

The first sum in the R.H.S. of (2.3) takes into account the effect of errors at inputs $X_k(t)$ on the output parameter $X_n(t)$ and the second sum - the total effect of random disturbances within the chain itself. The evaluation of these two sums is made under the following assumptions, often met in practice: 1) All errors $X_k(t)$ $(k = 1,2,\ldots,n-1,n)$ are delta-correlated, i.e.

$$K^m_{xx}(t_1,t_2) = \sigma^2_m\delta(t_1 - t_2) \tag{2.4}$$

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Applying statistical dynamics ...

2) all units in the chain are linear, i.e.

$$A_{tm}X_m(s) = \int_0^T W_m(t,s)\, X_m(s)ds \qquad (2.5)$$

Hence, for constant coefficients of mutual correlation

$$D_1 = \sum_{k=1}^{n} \frac{1}{\sigma^2_{k-1}} \left[K_{xy}^{(k-1)}\right]^2 \qquad (2.9)$$

and

$$D(\varepsilon_n) = D_k\left[X_n(s)\right] = \sigma_n^2 \left[r_{xy}^{(k-1)}\right]^2 \qquad (2.10)$$

Application of the above method makes it possible to determine the

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

Applying statistical dynamics ....

value of D_{1n} at the output of an automatic production line from the values of D_{1k} of every one of the constituent processes at the line:

$$D_{1n} = \sum_{i=1}^{n} A^{*}_{tk} K_{X_k X_n} \qquad (2.13)$$

where A^{*}_{tk} - the sample values of the operators of each of the processes. As an example the authors consider determination of the characteristics of the automatic production line of the first State Bearing Manufacturing Factory in finishing the outer ring of roller bearing type 7815K1. The production line characteristics were determined from the results of measurements carried out by the Laboratory of the Institute of the Science of Machines ИМАШ of the AS USSR and all data presented by M. I. Kochenov and V. I. Sergeyev.

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Applying statistical dynamics ...

There are 6 figures, 2 tables and 7 Soviet-bloc references.

SUBMITTED: January 20, 1961

4

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APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

Transactions of the 6th Conf. on Probability Theory and Mathematical Statistics and of the Symposium on Distributions in Infinite-Dimensional Spaces held in Vil'nyus, 5-10 Sep '60. Vil'nyus Gospolitizdat Lit SSR, 1962. 493 p. 2500 copies printed

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

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D201/D308

16.8000

AUTHORS: Rayevskiy, S. Ya., and Raibman, N. S. (Moscow)

TITLE: A statistical method of determining the unknown multi-dimensional operators of automation objects in a slightly non-linear approximation

PERIODICAL: Avtomatika i telemekhanika, v. 22, no. 7, 1962, 918-925

TEXT: The authors give the general theory of determining the unknown multi-dimensional, slightly non-linear operators of the process from the statistical properties of inputs and outputs. The class of the slightly non-linear operators, as considered in the article, has to satisfy by definition the following conditions: (1) The result of acting of all inputs on the i-th output is given by

$$Y_i(t_i) = \sum_{j=1}^{m} a_{ij} x_j(s_j) , \qquad (1.2)$$

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A statistical method...

where a_{ij}--the non-linear operator relating the j-th input to the i-th output; and (2) all operators a_{ij} are represented in the form of

$$a_{ij} = b_{ij}x_j(u_j) + c_{ij} , \qquad (1.3)$$

where b_{ij} and c_{ij}--unknown linear operators not correlated to the input. By means of setting up all necessary instantaneous functions of inputs and of interactions between inputs and outputs, a system of $2(nxm)$ equations is obtained which makes it possible to determine $2(nxm)$ linear operators b_{ij} and c_{ij} ($i = 1, 2,..., n$; $j = 1, 2,..., m$). The solution of this system results in the best evaluation, from the point of view of the criterion of minimum of the r.m.s. error, of the unknown operators of the multidimensional process the evaluation of the multidimensional operator, within the class of slightly non-linear

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APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, S.Ya. (Moskva); RAYBMAN, N.S. (Moskva)

Statistical method for determining unknown multidimensional operators of automatic control objects in almost linear approximation. Avtom. i telem. 23 no.7:918-925 Jl '62. (MIRA 15:9)

(Automatic control)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AP4041466 S/0103/64/025/006/0909/0916

AUTHOR: Rayevskiy, S. Ya. (Moscow)

TITLE: Statistical method for determining essentially nonlinear characteristics of an automated plant

SOURCE: Avtomatika i telemekhanika, v. 25, no. 6, 1964, 909-916

TOPIC TAGS: automatic control, automatic control theory, automation, automated plant

ABSTRACT: A general method for determining the essentially nonlinear characteristics of a plant is developed on the basis of N. Wiener's work ("Nonlinear problems in the theory of random processes"). A Bayes solution in the form $Y^*(t) = \sum_{k=0}^{\infty} A^*_{kt} X(s)$, is sought; here, A^*_{kt} are nonlinear operators that depend on the argument t. This solution is generalized to cover the case of a multi-input

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ACCESSION NR: AP4041466

and multi-output plant. Practical recommendations on using the statistical method (selection of functions, order of nonlinearity) are given. The conventional linear method of evaluating unknown characteristics of the plant becomes a particular case of the general method developed. A system consisting of linear and essentially nonlinear inertialess units is used as an example for determining the characteristics by the above method. Orig. art. has: 2 figures and 35 formulas.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00

SUB CODE: DP, IE NO REF SOV: 008 OTHER: 001

Card 2/2

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

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L 48963-65 EWT(d)/EWP(v)/T/EWP(k)/EWP(h)/EWP(l) Pf-4 IJP(c)

ACCESSION NR: AP5011908 UR/0103/65/026/004/0654/0662

AUTHOR: Rayevskiy, S. Ya. (Deceased) (Moscow)

TITLE: Orthogonal representation of random functions in the statistical dynamics of automatic control systems. Part I

SOURCE: Avtomatika i telemekhanika, v. 26, no. 4, 1965, 654-662

TOPIC TAGS: orthogonal representation, random function, statistical dynamics, automatic control function

ABSTRACT: The first part of the article develops a system of orthogonal polynomial functionals for the orthogonal representation of arbitrary random functions. It represents a generalization of numerous known orthogonal representations of random functions. The second part of the article shows that the special case, having at the input a stationary white Gaussian noise process, reduces to the special orthogonal representation due to N. Wiener (Nonlinear problems in the theory of random processes). Orig. art. has: 50 formulas.

ASSOCIATION: None

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

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ACCESSION NR: AP5011908

SUBMITTED: 29May64 ENCL: 00 SUB CODE: IE, MA

NO REF SOV: 001 OTHER: 002

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

L 63193-65 EWT(d)/EPF(n)-2/T/EWP(1) IJP(c) WW/BC
ACCESSION NR: AP5015907 UR/0103/65/026/006/1037/1043
62-50:517.5

AUTHOR: Rayevskiy, S. Ya. (Moscow)

55

16,55

93
B

TITLE: Orthogonal representation of random functions in problems of statistical dynamics of automatic-control systems. Part 2

SOURCE: Avtomatika i telemekhanika, v. 26, no. 6, 1965, 1037-1043

TOPIC TAGS: automatic control, automatic control design, automatic control system, automatic control theory

ABSTRACT: The problem of nonlinear optimal filtration is solved by means of a quasi-orthogonal representation of random functions. In order to solve the set of integral equations describing the problem, a modified criterion of the mean-square-error minimum is suggested; this criterion permits dealing with a finite number of terms of the series included in the solution. A functional equation of this form: $M\{\rho[Y(t), Y^*(t)]\} = \min$ is considered; here, $\rho(Y, Y^*)$ is a function of

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two arguments and M is the mathematical expectation. A particular case of this equation is solved: the function Y(t) is the desirable output, and its statistical characteristics are found. The latter finding also applies to (k + 1)-variable random processes of the form $\{Y(t)X(t_1)\ldots X(t_k)\}$. In determining the plant nonlinear characteristics, the function Y(t) will be the real output provided its statistical characteristics are found experimentally. Orig. art. has: 2 figures and 36 formulas.

ASSOCIATION: none

SUBMITTED: 29May64 ENCL: 00 SUB CODE: DP, IE

NO REF SOV: 004 OTHER: 000

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Card 2/2

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYAVSKIY, Yu.Ya. (Moskva)

Orthogonal representation of random functions in statistical dynamics of automatic control systems. Part 1. Avtom. i telem. 26 no.4:654-662 Ap '65. (MIRA 18:6)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, S.Ya. (deceased) (Moskva)

Orthogonal representation of random functions in problems of statistical dynamics of automatic control systems. Part 2 Avtom. i telem. 26 no.6: 1037-1043 Je '65. (MIRA 18:7)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V., operator

The boiler operator. Zhil.-kom.khoz. 12 no.8:16 Ag '62.
(MIRA 16:2)
(Heating)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

VORONENKOV, M.; RAYEVSKIY, V.

Constructive work of industrial teams. Sov. profsoiuzy 7 no.14:19-21 Jl '59. (MIRA 12:10)

1.Glavnyy inzhener Leningradskogo zavoda imeni Karla Marksa (for (for Voronenkov). 2.Predsedatel' zavkoma Leningradskogo zavoda imeni Karla Marksa (for Rayevskiy).
(Leningrad--Textile machinery)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AP4021969 S/0063/64/009/001/114/115

AUTHOR: Voyutskiy, S. S.; Rayevskiy, V. G.; Yagnyatinskaya, S. M.

TITLE: The role of adhesion in the reinforcement phenomena of elastomers.

SOURCE: Vsesoyuznoye khimicheskoye obshchestvo. Zhurnal, v. 9, no. 1, 1964, 114-115

TOPIC TAGS: elastomer, reinforcement, rubber, adhesion, reinforcement mechanism, filled resin, active filler, filler adhesion, resin strength, particle size

ABSTRACT: Experimental data and observations from the literature are offered to substantiate the belief that the reinforcement of elastomers filled with active fillers is directly associated with adhesion of the particles. Measurements show a linear function between the coefficient of reinforcement of rubbers and their resistance to lamination from glass of unmodified and modified (dimethyldichlorosilane, vinyltrichlorosilane and allyltrichlorosilane) SKB and SKN-40. The adhesive strength of polymeric adhesives increases as thickness decreases, to a limit, after which the strength decreases. The same relationship exists in reinforcing resin with filler, where the strength of the resin increases as filler

Card 1/3

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ACCESSION NR: AP4021969

content increases (thickness of resin layer between particles decreases), to a limit, and with overloading the filled resin strength decreases. Decreasing particle size, to a limit approaching molecular dimensions, also increases reinforcement of the resin. Adhesion of polymers increases with prolonged contact with the substrate and with increased temperature. The addition of filled resin and preheating of the fillers are known to strengthen the resin. The strength of adhesion increases with vulcanization time and goes through a maximum. The same relationship in the change of filled resin strength is observed by increasing the extent of vulcanization. It is concluded that the adhesive approach does not contradict present theories on reinforcement, and in fact, partially explains the reinforcement phenomenon. The average distance between particles in filled reinforced resins is considered to be not more than 200Å, with the elastomer macromolecule connecting the surfaces of several particles. Orig. art. has: 2 figures.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii M. V. Lomonosova (Moscow Institute of Fine Chemical Technology)

Card 2/3

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AP4021969

SUBMITTED: 29Oct63 DATE ACQ: 08Apr64 ENCL: 00

SUB CODE: PH, MA NO REF SOV: 003 OTHER: 005

Card 3/3

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V.G.; GUL', V.G.; ZAMYSLOV, V.B.; VOYUTSKIY, S.S.

Diffusion phenomena in mixtures of polymers. Zhur. VKHO 9 no. 2: 236-238 '64. (MIRA 17:9)

1. Moskovskiy tekhnologicheskiy institut myasnoy i molochnoy promyshlennosti.

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AP4030382 S/0063/64/009/002/0236/0238

AUTHOR: Rayevskiy, V. G.; Gul', V.G.; Zamy*slov, V. B.; Voyutskiy, S. S.

TITLE: Diffusion phenomena in polymer mixtures

SOURCE: Vsesoyuznoye khimicheskoye obshchestvo. Zhurnal. v. 9, no. 2, 1964, 236-238

TOPIC TAGS: polymer, diffusion, polyethylene polybutadiene mixture, microscopic analysis, mechanical property, filler, dispersiveness, incompatible polymer, polymer homogenization

ABSTRACT: The role of diffusion phenomena in mixed polymers was investigated and confirmed. Microscopic examination of films made of mixtures of low-pressure polyethylene and SKB-30 polybutadiene (15:85 parts by weight) revealed a gradual homogenization of the polyethylene filler particles with the polybutadiene, wherein the originally easily visible discrete particles appeared to dissolve in the matrix to form a fine granular structure which did not change toward the end of the 80-day test period. Mechanical properties of mixtures of polyethylene

Card 1/2

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ACCESSION NR: AP4030382

polybutadiene (30:70) were examined. The tensile strength increased to a maximum in 18—35 days, then decreased and leveled off after 80 days. This increase is explained by increased adhesion of the elastomer to the polyethylene filler; and the decrease, by the increased dispersion of the filler which reduces its strengthening properties. Elongation increased with increased homogenization of the system. Thus, in mixed systems the diffusion process leads to partial homogenization. In mixtures of incompatible polymers, diffusion would have the opposite effect, promoting separation and transition from a microheterogeneous to a macroheterogeneous system. Orig. art. has: 2 figures.

ASSOCIATION: Moskovskiy tekhnologicheskiy institut myasnoy i molochnoy promy* shlennosti (Moscow Technological Institute for the Meat and Milk Industry)

SUBMITTED: 26Oct63 ATD PRESS: 3051 ENCL: 00

SUB CODE: OC NO REF SOV: 008 OTHER: 001

Card 2/2

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V.G.; STOGOVA, L.P.

Effect of rot-proofing impregnation of the fabric on some properties of rubberized fabrics. Kauch. i rez. 23 no.1: 27-31 Ja '64. (MIRA 17:2)

1. Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti.

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

L 12015-65 EWT(m)/EPF(c)/EWP(j)/T Pc-4/Pr-4 ASD(m)-3 RM
ACCESSION NR: AP4046467 S/0032/64/030/010/1222/1224

AUTHOR: Voyutskiy, S. S.; Yagnyatinskaya, S. M.; Frumkin, L. S.; Yepiseyeva, S. N.; Rayevskiy, V. G.

TITLE: Method for determining the adhesion of polymers to powder fillers

SOURCE: Zavodskaya laboratoriya, v. 30, no. 10, 1964, 1222-1224

TOPIC TAGS: adhesion, polymer, filler, powder filler, sodium butadiene rubber, nitrite rubber, chalk, chemical black

ABSTRACT: A new method has been developed for determining the adhesion of polymers to any powder filler. The method is based on the use of substrates prepared from mixtures of various amounts of a powder filler with a binder. The surface of the substrate must be mechanically pretreated and cleaned to ensure close contact between the filler particles and the polymer. The adhesion of the polymer to the pure filler was determined by graphic extrapolation of experimental curves of adhesion values versus binder/filler ratio to a zero binder content. The results of experiments conducted with: 1) sodium buta-

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L 12015-65
ACCESSION NR: AP4046467

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diene (CKB-35) rubber as the polymer and mixtures of poly(vinyl alcohol) (binder) and chalk (inactive filler) as the substrate, and 2) with nitrite (CKN-40) rubber as the polymer and mixtures of poly(vinyl alcohol) (binder) and chemical black (active filler) as the substrate are given in Figs. 1 and 2 of the Enclosure. The dotted lines are the curve sections extrapolated to a zero binder content. Their intersections with the ordinate indicate the adhesion of the polymer to the pure filler. Orig. art. has: 2 figures.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova (Institute of Fine Chemical Technology)

SUBMITTED: 00 ENCL: 02 SUB CODE: GC

NO REF SOV: 003 OTHER: 004 ATD PRESS: 3124

Card 2/4

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

L 12015-65
ACCESSION NR: AP4046467

ENCLOSURE: 01

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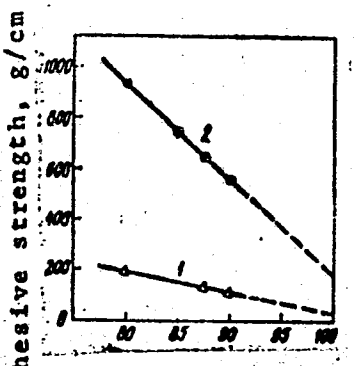

Fig. 1. Adhesive strength of CKB-35 to substrate depending on its chalk content

1 and 2 - adhesive joints prepared at 20 and 70C, respectively.

Card 3/4

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L 12015-65
ACCESSION NR: AP4046467

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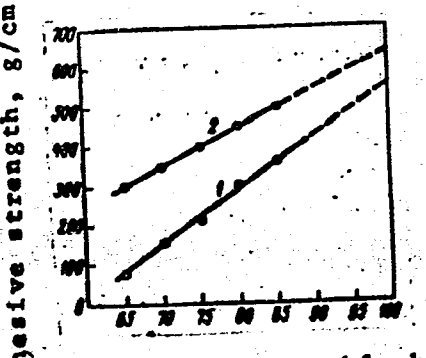

Fig. 2. Adhesive strength of CKN-40 to substrate depending on its carbon black content

1 and 2 - adhesive joints prepared at 20 and 70C, respectively.

Card 4/4

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

L 47749-65 EWT(m)/EPF(c)/EWP(v)/T/EWP(j)/EPR Pc-4/Pr-4, Ps-4 WW/RM 35 B

ACCESSION NR: AP5012424 UR/0374/65/000/002/0015/0020

AUTHOR: Maloshuk, Yu. S. (Moscow); Rayevskiy, V. G. (Moscow); Semenikhina, A. A. (Moscow); Voyutskiy, S. S. (Moscow)

TITLE: Cohesion of industrial elastomeric systems. 1. Effect of the compatibility of the plasticizer and elastomer on cohesion strength 15

SOURCE: Mekhanika polimerov, no. 2, 1965, 15-20

TOPIC TAGS: elastomer, plasticizer, compatibility, cohesion

ABSTRACT: A study has been made of the compatibility of plasticizers with polymers, of the cohesion strength of plasticized elastomeric systems, and of the relationship between this cohesion and compatibility. The experiments were conducted with (polar) nitrile rubber (SKN-40) and (nonpolar) polyisobutylene and the following plasticizers or their mixtures: dibutyl phthalate, PN-6 oil (molecular weight, 482; aromatic fraction, 90%; paraffin-naphthene hydrocarbons, 2.3%; resins, 6.7%), and industrial and medical mineral oils. Compatibility was estimated from swelling kinetics curves. For the case of (polar) SKN-40, compatibility increased with the polarity of the plasticizer. Dibutyl phthalate was shown to be fully compatible with this rubber. For the case of (nonpolar) PN-6, compatibility dropped with the polarity of the plasticizer. The cohesion strength of plasticized elastomeric sys-

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

L 47749-65

ACCESSION NR: AP5012424

tems was determined by stripping tests. Curves of cohesion strength versus holding time (under a 100 g/cm^2 compressive load) were plotted. The cohesion strength of the systems increased with compatibility. Curves of cohesion strength versus maximum swelling of plasticized systems were plotted. From these curves it was concluded that the cohesion strength is directly proportional to compatibility. Orig. art. has: 6 figures and 1 table. [BO]

ASSOCIATION: none

SUBMITTED: 01Dec64 ENCL: 00 SUB CODE: MT, FP

NO REF SOV: 011 OTHER: 002 ATD PRESS: 4004

Card 2/2

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

L 59223-65 EWT(m)/EPF(c)/EWP(v)/EPR/EWP(j)/T Pc-4/Pr-4/Ps-4 WW/RM

ACCESSION NR: AP5016877 UR/0374/65/000/003/0003/0007
678:539.015

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B

AUTHOR: Rayevskiy, V.G.; Makarskaya, L.V.; Gul', V. Ye.

TITLE: Effect of the size of spherulites on the adhesion of polypropylene

SOURCE: Mekhanika polimerov, no. 3, 1965, 3-7

TOPIC TAGS: polypropylene, polymer adhesion, spherulite, butadiene elastomer, cohesive strength

ABSTRACT: The effect of the growth of spherulites (25–185 microns in diameter) on the adhesive properties of polypropylene and its density was investigated. The adhesive properties were estimated from the introduced "adhesiveness" and "adhesive susceptibility" characteristics. It was shown that, in contrast to the change in cohesive strength, the strength of adhesive bonds between polypropylene (substrate) and the SKB butadiene elastomer (adhesive) rises somewhat with increasing diameter of the spherulites, and that the density of polypropylene increases in linear fashion. It is postulated that the change observed in the adhesive susceptibility is due to the development of the surface of the samples, which accompanies the growth of the spherulites. Orig. art. has: 2 figures and 1 table.

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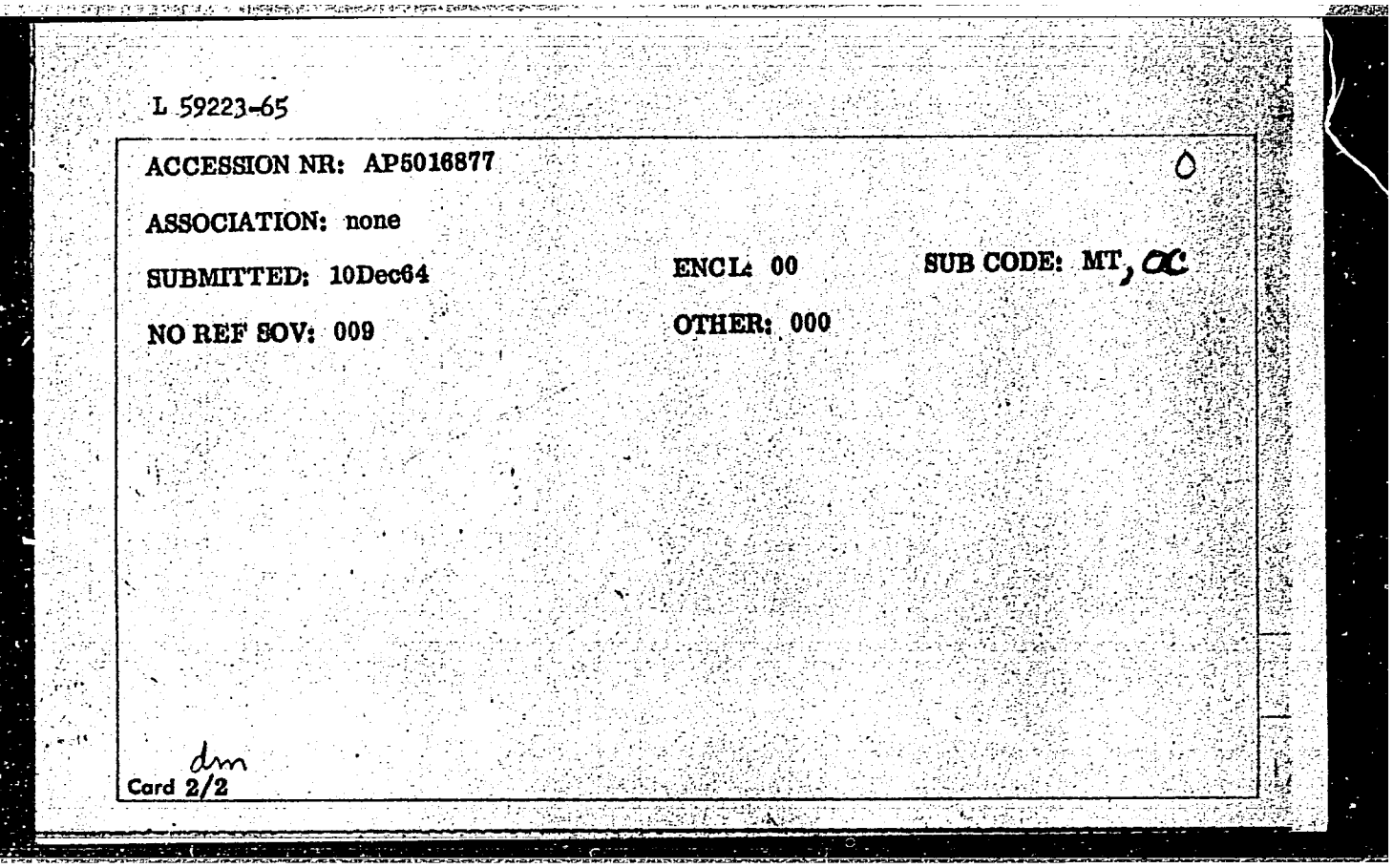

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ACCESSION NR: AP5016877 0

ASSOCIATION: none

SUBMITTED: 10Dec64 ENCL: 00 SUB CODE: MT, AC

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AP4042339 S/0138/64/000/007/0016/0020

AUTHOR: Voyutskiy, S. S.; Rayevskiy, V. G.; Yagnyatinskaya, S. M.

TITLE: Role of adhesion in the elastomer reinforcement phenomenon

SOURCE: Kauchuk i rezina, no. 7, 1964, 16-20

TOPIC TAGS: elastomer, rubber, rubber reinforcement, filler, active filler, adhesion, adhesive joint, microscopic adhesive joint

ABSTRACT: It is hypothesized that mixtures of elastomers and active fillers consist of a great number of microscopic particles of the solid filler bonded with rubber (adhesive joints). An attempt is made to substantiate the hypothesis by the following considerations: 1) rubber can be reinforced only with fillers the strength and hardness of which are higher than those of the rubber; 2) carbon black reinforces only elastomeric (and not resinous) butadiene-styrene rubbers; 3) flocculation or adhesion of active filler particles resulting in the formation of a "carbon-black gel" plays an important role in the reinforcement of rubber; 4) phenomena of elastomer reinforcement and phenomena of adhesion or bonding follow identical laws,

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ACCESSION NR: AP4042339

and factors such as glue-line thickness, contact time, temperature, and vulcanization time which increase the strength of the microscopic adhesive joints increase the reinforcement of rubber and vice versa. The hypothesis on the adhesive nature of rubber reinforcement does not contradict either the chemical theory of reinforcement (because, in many instances, adhesion is caused by chemical reactions) or the theory that reinforcement is a result of the formation of filler particle chains (because two individual filler particles can be bonded by sections of one and the same polymer macromolecule). The electric conductivity of rubber mixes and vulcanizates containing certain blacks can be explained by the formation of point contacts between neighboring filler particles. Orig. art. has: 4 figures.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova (Moscow Institute of Fine Chemical Technology)

SUBMITTED: 00 ATD PRESS: 3054 ENCL: 00

SUB CODE: MT NO REF SOV: 013 OTHER: 016

Card 2/2

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V.G.; VOYUTSKIY, S.S.; LIVANOVA, I.V.

Effect of the structuration of elastomers on their adhesion to fiber-forming polymers. Part 2: Effect od double bonds in side chain groups of molecules of elastomers. Vysokom.soed. 4 no.3:366-370 Mr '62. (MIRA 15:3)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni Lomonosova i Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti.
(Elastomers) (Adhesion) (Chemical bonds)

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15 9300
11211

AUTHORS: Rayevskiy, V. G., Voyutskiy, S. S., Livanova, I. V.

TITLE: Effect of structuration of elastomers on their adhesion to fiber forming polymers. II. Effect of double bonds in molecular side groups of elastomers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 3, 1962, 366-370

TEXT: The effect of vulcanization on the strength of branched elastomers able to bind sulfur to the double bond of vinyl side groups is studied. Rubbers on the basis of СКБ (SKB), СКБМ (SKBM), and СКД (SKD) polybutadiene rubbers containing vulcanization groups and 10 parts by volume of lampblack were calendered on polycaprolactam (Perfiol ПК-4 (PK-4)) and hydrate cellulose films. Vulcanization was conducted at 134°C and ≈0.85 kg/cm^2 on the drum vulcanizer "Berstorf". When the molecules contain vinyl side groups, sulfur and also oxygen may add and influence the adhesion of elastomers, which was determined according to ГОСТ 6768-53 (GOST 6768-53). Double bonds do not change the dependence of exfoliation resistance on the vulcanization time. The maximum for SKB is ~ 7 min,

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Effect of structuration of ...

1.1 kg/cm, that for SKBM is ~10 min, 1.0 kg/cm, since SKB contains a number of branches. The change in exfoliation character for SKB and SKBM is due to stronger adhesion with constant cohesion. The difference in time is explained by a higher rate of solidification of the adhesive bond and somewhat lower cohesional force of SKB. The dependence curve of the adhesion of SKB and SKBM rubber on the structuration degree (molecular weight M_c of the chain link), after vulcanization has a flatter drop than the corresponding curve for butyl rubber, butadiene styrene and butadiene acrylonitrile elastomers. In the vulcanization of butadiene elastomers, sulfur attaches to the double bonds of the principal and vinyl side chains, forming numerous sulfurous groups with intramolecular interaction, and also large, hardly mobile, cyclic sections. The diffusion rate therefore decreases at a M_c higher than that of elastomers with intermolecular sulfur addition only. The structuration degree depends on the number of links bound in the 1-2 position of elastomers. An increase in the number of links in the 1-2 position reduces the adhesive strength at higher M_c, increases the double bonds in the side groups and the $M_{c\ max}$, and decelerates the decrease in adhesive strength after maximum structuration. There are 4 figures.

Card 2/3

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ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni M. V. Lomonosova (Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov)
Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry)

SUBMITTED: February 20, 1961

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B110/B144

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AUTHORS: Rayevskiy, V. G., Voyutskiy, S. S., Livanova, I. V.

TITLE: Effect of the structuration of elastomers on their adhesion to fiber-forming polymers. III. Effect of the type of vulcanization of rubbers on the change in strength of the adhesion bond

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 5, 1962, 696-701

TEXT: The authors studied (1) the vulcanization of SKB-35r (SKB-35r) sodium butadiene rubber with tetramethyl thiuram disulfide alone, and (2) the vulcanization of polychloroprene rubber in the additional presence of oxides of multivalent metals. The maximum strength of the adhesion bond was reached much earlier than with sulfur vulcanization. Examination of the structuration rate of the rubbers showed that the degree of structuration of the thiuram vulcanizate (I) in the first 30 min was higher than that of the sulfur vulcanizate (II). After long-time vulcanization it remained unchanged with I and increased with II.

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Effect of the structuration of ...

The maximum strength of the adhesion bond of I is lower since I diffuses less readily than II (II = 1050 g/cm; I = 480 g/cm). The maximum degree of structuration, after which the strength of the adhesion bond decreases, is: $M_{c\ max} \approx 50{,}000$ for II, and $M_{c\ max} \approx 65{,}000$ for I. This confirms the effect of the macromolecular bonds formed on vulcanization. The -C-C- and C-S-C bonds of I are more rigid than the $-C-S_n-C-$ bonds of II. The strength of bonds between rubber and fiber-forming polymers is thus reduced, and optimum adhesion is shifted toward a lower degree of structuration. Furthermore, the authors studied the effect of the vulcanization of rubber mixtures on the basis of polychloroprene rubber (nairit) with zinc and magnesium oxide on the change in strength of adhesion bonds between rubbers and fiber-forming polymers. The adhesion bond of polychloroprene elastomers with polycaprolactam and hydrate cellulose showed no change in the dependence of the strength of adhesion bonds on the vulcanization time by metal oxides. Here, too, the optimum occurred at a shorter vulcanization time than with II. Since the adhesion strength reached a maximum at $M_{c\ max}$ = 7-7500 and decreased

Card 2/3

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

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Effect of the structuration of ...

Subsequently, the type of vulcanization was found to have no effect with links bound in the 1,4 position. $M_{c\ max}$ does not depend on the type of bonds between macromolecules, but on the content in lateral vinyl groups. There are 5 figures and 1 table.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova (Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov); Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry)

SUBMITTED: March 31, 1961

Card 3/3

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

PANOV, V.A.; GORULEVA, V.P.; MOROZOV, B.I.; RAYEVSKIY, V.G.; VOYUTSKIY, S.S.

Increasing the bonding strength of rubber and fabric by means of correcting the vulcanizing group. Kauch.i rez. 21 no.11:4-6 N '62. (MIRA 15:12)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni Lomonosova.

(Rubberized fabrics)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V.G.; MAYZELS, M.G. [deceased]; VOYUTSKIY, S.S.; Prinimala uchastiye: SHTEYNBERG, Z.D.

Binding strength between a rubber covering and a caracasse and its effect on some properties of rubberized materials. Kauch.i rez. 21 no.2:17-23 F '62. (MIRA 15:2)

1. Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti. (Rubberized fabrics) (Adhesion)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V.G.; VOYUTSKIY, S.S.; YAGNYATINSKAYA, S.M.; SHTEYNBERG, Z.D.

Adhesive strength of rubber coatings on a textile carcass as dependent on the rate of casing in calendars. Kauch.i rez. 21 no.9:8-12 S '62. (MIRA 15:11)

1. Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti.

(Rubberized fabrics)
(Adhesion)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AR4042249 S/0081/64/000/008/S020/S020

SOURCE: Ref. zh. Khimiya, Abs. 8S102

AUTHOR: Rayevskiy, V. G.; Yegorov, Ye. V.; Mikhlin, V. E.; Gul', V. Ye.; Voyutskiy, S. S.

TITLE: Influence of radiochemical cross-linking of elastomers on their adhesion to fiberforming polymers

CITED SOURCE: Sb. Vy*sokomolekul. soyedineniya. Adgeziya polimerov. M., AN SSSR, 1963, 89-93

TOPIC TAGS: elastomer, adhesion, polymer, radiochemistry, radiation vulcanization

TRANSLATION: The change of durability of adhesion of elastomers SKS-30 ARM-15, SKN-26 and butyl rubber with polycaprolactam film during irradiation of samples by a flow of accelerated electrons was examined. It was determined that the change of resistance to separation during irradiation is described by curves passing through a maximum which corresponds to a definite integral dose of irradiation.

Card 1/2

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ACCESSION NR: AR4042249

Thus the character of the change in adhesion strength during radiation vulcanization does not differ qualitatively from that observed earlier for cases of thermal vulcanization in the presence of vulcanizing agents. For samples with coatings of SKS-30 ARM-15 the dependence of the adhesion of this elastomer to polycaprolactam film was studied from the degree of its cross-linking during irradiation. The latter was characterized by the length of the section of molecular chain (M_c), included between two nodes of the space lattice. It was shown that the limiting degree of cross-linking, after the achievement of which a drop of adhesion strength sets in, shifts under the influence of radiation in the direction of a smaller density of the lattice, as compared to that observed for thermal vulcanization in the presence of vulcanizing agents. This phenomenon is explained from the positions of diffusion theory of adhesion. The presence of a limiting degree of cross-linking during radiation vulcanization was observed also on rubber-fabric materials based on capron fabric with a coating of Nairit and SKS-30 ARM-15 applied by facing the fabric on a calender. From authors' abstract.

SUB CODE: MT, OC ENCL: 00

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

ACCESSION NR: AR4040827 S/0058/64/000/005/E009/E010

SOURCE: Ref. zh. Fizika, Abs. 5E61

AUTHOR: Voyutskiy, S. S.; Rayevskiy, V. G.; Yagnyatinskaya, S. M.

TITLE: Influence of the physical state of polymers on their adhesion

CITED SOURCE: Sb. Vy*sokomolekul. soyedineniya. Adgeziya polimerov, M., AN SSSR, 1963, 128-133

TOPIC TAGS: polymer, adhesion, polyethylene, elastomer, diffusion theory

TRANSLATION: There is investigated with dependence of resistance to stratification P of compounds of polyethylene with elastomers of different chemical nature on the time of forming of a splice τ at room temperature and a temperature of fusing of polyethylene of 120°C. During preparation of the splice, elements of the compound were placed in contact after achievement of the given temperature. It is shown that with an increase of τ, adhesion is increased. Increase of tempera-

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ture of splice forming to 120°C increases the adhesion 40 - 70-fold. At 120°C curves $P - \tau$ for all elastomers have the form $P = k\tau^{\alpha}$ (k and α — parameters). With increase of number of polar groups in elastomers, adhesion decreases and can attain practically zero values. The results are explained from the point of view of the diffusion theory of adhesion on the basis of the idea of local diffusion, introduced by the authors, explaining the formation of an adhesional bond between polar and nonpolar polymers.

SUB CODE: OC, GC ENCL: 00

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

RAYEVSKIY, V.G.; VOYUTSKIY, S.S.

Effect of structuration of elastomers on their adhesion to fiber-forming polymers. Part 4: Effect of prevulcanization of compounds on their adhesion to fiber-forming polymers. Vysokom. soed. 5 no.1:108-111 Ja '63. (MIRA 16:1)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M.V. Lomonosova i Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti.
(Elastomers) (Adhesion) (Polymers)

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

VOYUTSKIY, S.S., RAZEVSKIY, V.G., YAGNYATINSKAYA, S.M.

Adhesion between polymers as influenced by their physical state.
Dokl. AN SSSR 150 no.6:1296-1299 Je '63. (MIRA 16:8)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M.V. Lomonosova i Problemnaya laboratoriya pererabotki i modifikatsii polimerov Moskovskogo tekhnologicheskogo instituta myasnoy i molochnoy promyshlennosti. Predstavleno akademikom S.S.Medvedevym.
(Polymers) (Adhesion)

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L [illegible]-65 EWT(j)/EWT(m)/EPF(c)/EPF(n)-2/EWG(v)/EWP(v)/EPR/EWP(j)/T/EWA(h)/
[illegible](l) Pc-4/Pe-5/Pr-4/Ps-4/Pu-4/Peb RPL GG/RM/WW/GS
ACCESSION NR: AT4049836 S/0000/64/000/000/0008/0012

AUTHOR: Gol'danskiy, V. I.; Gul', V. Ye.; Yegorov, Ye. V.; Zil'berg, G. A.; [illegible], V. E.; Rayevskiy, V. G.

TITLE: A new radiochemical method for preparing graft copolymers and their possible uses for increasing the bond strength between rubber and fabric

SOURCE: Khimicheskiye svoystva i modifikatsiya polimerov (Chemical properties and the modification of polymers); sbornik statey. Moscow, Izd-vo Nauka, 1964, 8-12

TOPIC TAGS: graft copolymer, bond strength, rubber fabric laminate, neutron irradiation, polycaproamide, elastomer, polymer impregnation, Capron fabric

ABSTRACT: Utilizing the localized effect of neutron irradiation, a new method was developed for obtaining graft copolymers; this was based on the irradiation of emulsions containing both polymer components and a lithium (boron) compound by a flow of thermal neutrons. The graft copolymers tested were obtained by irradiation, in a nuclear reactor, of emulsions made from a mixture of polycaproamide in formic acid, containing a Li compound, with solutions of elastomers in o-xylene. Infrared spectra showed the presence of a radiochemical interaction between the elastomer molecules and polycaproamide with the formation of a graft copolymer.

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The composition of the resin mixture is tabulated. The resin coating was 0.2 0.02 mm thick. The vulcanized samples were tested on a Schopper apparatus. Tabulated data show that impregnation of Capron fabric with a non-irradiated emulsion decreases the bond strength between rubber and fabric by 30-40%, due to a decrease in the mechanical adhesion and the low cohesive strength of the adhesive. The use of the impregnating solution containing graft copolymer increases the bond strength by 45-60% as compared to the initial value. By combining impregnation of the fabric with a solution of epoxyamide resin (No. 89) and impregnation with a solution of an elastomer and a graft copolymer, the bond strength between the rubber and the fabric was almost doubled as compared to the strength obtained by impregnating only with epoxyamide, and increased four times as compared to materials based on nonimpregnated Capron fabric. Other modifications of the method of localized neutron irradiation permit the bond strength to be increased to 4.1 kg/cm, this value being limited by the cohesion of the rubber coating. This variant of the method will be described in a subsequent publication. Orig. art. has: 1 figure and 3 tables.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Chemical physics institute, AN SSSR); Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova (Moscow fine chemical technology institute)

SUBMITTED: 18Apr62 ENCL: 00 SUB CODE: OC, MT

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APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5"

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VOYUTSKIY, S.S.; RAYEVSKIY, V.C.; YAGNYATINSKAYA, S.M.

Role of adhesion in the phenomenon of the reinforcement of elastomers. Kauch. i rez. 23 no.7:16-20 Jl '64. (MIRA 17:8)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii im. Lomonosova.

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

5(1, 5) SOV/153-58-5-19/28

AUTHORS: Gul', V. Ye., Faynberg, R. Ya., Maymel's, M. G., Ravevskiy, V. G., Sin'kova, M. I.

TITLE: I. Physico-Chemical Characteristics of the Wetting Process of Textile Materials With Solutions of High-Molecular Compounds (I. Fiziko-khimicheskiye kharakteristiki protsessov smachivaniya tekstil'nykh materialov rastvorami vysokomolekulyarnykh soyedineniy)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya tekhnologiya, 1958, Nr 5, pp 114-119 (USSR)

ABSTRACT: The mechanism of the interactions of the processes mentioned in the title is of scientific and practical interest. The application of rubber glues on a textile basis in the production of gummed tissues can serve as example. As the wetting represents the first elementary interaction process therein, it can exert essential influence on the characteristics of adhesion. The dependence of the wetting upon the nature and the structure of the glues and the textile materials must therefore be studied. Apparently the value Θ cannot supply any clear characteristic feature of the adhesion to textiles in the case of glue (just as with latex, Refs 1, 2). On the other hand, the authors re-

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I. Physico-Chemical Characteristics of the Wetting Process of Textile Materials With Solutions of High-Molecular Compounds

garded it as possible to determine such a characteristic feature by studying the variation kinetics of the angle θ with respect to time. For this purpose they selected the method of the indirect measurement of the external angle θ of the wetting on an enlarged picture of the drop projected unto a screen. It could be proved that 1) the variation character of the curves of the said angle reflects the totality of the processes taking place during the interaction of the glue with the cloth; these processes are the soaking and the evaporation in a room saturated with evaporated solvents (Figs 1, 4) besides these processes in an unsaturated room (Figs 3, 5); 2) It was proved that the residual values of θ increase with the viscosity of the glue, whereas the total velocity of the processes, soaking and deliquescence, decrease. 3) The kinetic parameter τ_{max} was determined; it is the period of time within which the drop has reached a stable state. This parameter is a criterion of the degree of susceptibility of various textiles to rubber glue (cotton - perkal' B, caprone art. 1516 and 1520, glass cloth

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I. Physico-Chemical Characteristics of the Wetting Process of Textile Materials With Solutions of High-Molecular Compounds

ESTBO 11) 4) Inspite of the decrease in viscosity η and of the surface tension σ the addition of polar admixtures slows down the decrease of the external angle with time and increases the value of τ_{max}. 5) The adhesion characteristics of the glue-tissue systems investigated were determined. They are in good correlation with the wetting parameters θ and τ_{max}. 6) It was found possible to predetermine the interaction character of the glue with the textile base as well as the binding strength of these elements in finished constructions of gummed cloths by means of the degree and the variation character of the parameters θ and τ_{max}. There are 8 figures, 3 tables, and 6 Soviet references.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii i nauchno issledovatel'skiy institut rezinovoy promyshlennosti (Moscow Institute for Fine Chemical Technology and Scientific Research Institute for Rubber Industry)

SUBMITTED: December 2, 1957

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

SOV/138-58-10-3/10

AUTHORS: Mayzel's, M. G; Rayevskiy, V. G; Parshina, Ye. A.

TITLE: Butyl Rubber (Butilkauchuk). I. The Principles of Establishing an Economical Technology for the Production of Rubber Products Based on Butyl Rubber (Printsipy postroyeniya ratsional'noy tekhnologii proizvodstva rezinovykh tekhnicheskikh izdeliy na osnove butilkauchuka)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 10, pp 11 - 15 (USSR)

ABSTRACT: During investigations of the above principles, butyl rubber "B" with a molecular weight of 39,000 was tested. Plasticisation of butyl rubber was found to be ineffective because of the high degree of saturation of the rubber which may cause destructive oxidation. Several processes, such as mixing, refining, calendering and spraying can be carried out at increased temperatures. Investigations on the properties of butyl rubber mixtures showed that the load required for causing deformation decreases sharply at increasing temperatures (Fig.1). On comparing the temperature dependence and changes of the elastic properties of analogous mixtures of butyl rubber, and a number of other industrial polymers, it was found that the deformation of butyl rubber, within a given temperature interval, is characterised by the load and the reducing properties of

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Butyl Rubber (Butilkauchuk). 1. The Principles of Establishing an Economical Technology for the Production of Rubber Products Based on Butyl Rubber

the mixtures (Figs. 1 and 2). Mixing tests were carried out on butyl rubber coatings and adhesives containing larger and smaller amounts of fillers. This process could be carried out when the temperature of the rollers equals 75 - 85°C. Table 1 gives data on the energy consumption during the preparation of various rubber mixtures not containing fillers. The optimum temperature at the beginning of the mixing process was found to be of the order of 100°C with subsequent increase of the temperature to 120 - 130°C. Sulphur and thiuram is led onto the rollers. Mixtures containing 75% carbon black could be prepared in 8 - 10 minutes. The mixtures could be homogenised and purified by refining and straining; they could easily be calendered. The addition of stearin is recommended to improve calendering. The optimum temperatures of calendering were: temperature of the top roller 90 - 120°C, of the middle roller 90 - 110°C and of the bottom roller 30 - 100°C. The addition of fillers, such as 10 - 15% of a talcum mixture, also

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Butyl Rubber. 1. The Principles of Establishing an Economical Technology for the Production of Rubber Products Based on Butyl Rubber

improves conditions of calendering and imparts to the coating a smooth surface. The temperature conditions of the rollers should be slightly changed to 90 - 120°C on the top roller, 50 - 80°C on the middle roller and 70 - 100°C on the bottom roller. The temperature of calendering influences the bond strength of the rubber mixture (Fig.3). Spraying and straining of mixtures based on butyl rubber is only possible at high temperatures. The mixtures show a tendency to sedimentation. Mixtures not containing any fillers have 65 - 85% sediments according to the type of rubber used. Light fillers such as powdered silica gel, titanium white, calcium silicate and chalk or carbon fillers decrease the amount of deposits and improve the surface. The addition of plasticisers improves conditions of spraying. Adhesives based on butyl rubber can easily be prepared because butyl rubber shows good solubility in aromatic hydrocarbons, and also in petroleum ether. A graph shows the effect of the treatment of textiles and the strength of the bond of calendered substances (Fig.5). Butyl rubber adhesives cannot be mixed with adhesives based on other polymers because butyl rubber cannot be vulcanised in the presence

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Butyl Rubber. 1. The Principles of Establishing an Economical Technology for the Production of Rubber Products Based on Butyl Rubber

of unsaturated compounds. The time required for vulcanising mixtures based on butyl rubber can be shortened from 45 to 50 minutes to 15 minutes when increasing the vulcanisation temperature from 143 to 159°C (Fig.6). The strength of the butyl rubber vulcanisates and other polymers is affected by the vulcanisation temperature (Fig.7). A shorter time of vulcanisation can also be achieved by increasing the unsaturation of the butyl rubber. High quality rubberised substances are obtained by vulcanisation. The continuous vulcaniser "Berstorf" was used in these experiments. Optimum conditions of vulcanisation of rubberised substances based on butyl rubber are tabulated (Table 2). Optimum conditions for moulded articles from butyl rubber are listed. There are

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SOV/138-59-10-3/10

Butyl Rubber. 1. The Principles of Establishing an Economical Technology for the Production of Rubber Products Based on Butyl Rubber

7 Figures, 2 Tables and 5 References: 3 Soviet, 2 English.

ASSOCIATION: Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Research Institute of the Rubber Industry)

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"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001444410008-5

SOV/138-58-12-2/17

AUTHORS: Mayzel's, M. G; Rayevskiy, V. G. and Parshina, Ye. A.

TITLE: Butyl Rubber (Butilkauchuk). Principles of Formulating Effective Compositions of Rubber Mixtures (Printsipy postroyeniya ratsional'noy retseptury rezinovykh smesey)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 12, pp 3 - 8 (USSR)

ABSTRACT: At present, three types of butyl rubber (A, B and C) are used in industry which differ by their molecular weight: (A) not less than 40,000, (B) not less than 35,000 and (C) not less than 30,000. The technological, as well as physico-mechanical characteristics of vulcanisates (strength, relative and residual elongation, wear and tear resistance, and adhesive properties) depend on the molecular weight. The various uses of these three types of butyl rubber are described. Investigations showed that the bond strength of rubbers increases with decreasing molecular weight of the butyl rubber. This data agrees with the contemporary theory on theadhesion of high polymers according to which the bond strength of polymeric material depends on the diffusion of the terminal parts of the molecular chains (Ref.1). Various types of vulcanisation agents were tested and the physico-mechanical characteristics of the

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Butyl Rubber. Principles of Formulating Effective Compositions of Rubber Mixtures

butyl rubber vulcanisates, containing an optimal vulcanisation group and vulcanised at different temperatures, are shown in Fig.1. The most suitable mixture was: sulphur 1%, thiuram 1.3% and captax 1%. A further increase in the amount of accelerator is not permissible because migration occurs. The effect of various fillers on the mechanical properties and thermal stability of vulcanisates was investigated. Butyl rubber is a crystalline polymer and, therefore, the introduction of active fillers does not increase the strength of the vulcanisates. The addition of fillers increases some of the physico-mechanical characteristics of the vulcanisates and their stability to ageing and to aggressive media, and also ensures the required quality. The addition of furnace and lamp black decreases their break resistance, but increases to a slight degree their tear resistance. Carbon blacks increase resistance to ageing, hardness and elasticity. Powdered silica gel, kaolin and titanium dioxide are most satisfactory as fillers. Table 1: data on the characteristic influence of a number of light fillers on the basic physico-mechanical

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characteristics of butyl rubber C. Butyl rubber shows a high degree of saturation and, therefore, S-bonds are of less importance during the formation of the structure of the vulcanisate than in other unsaturated rubbers. The thermo-stability of the rubber is increased when 50 - 60% of gas channel black (Fig.2) is added. Relevant tests were carried out in the temperature interval from +25°C to 150°C. The tear and break resistance are also increased (Fig.3). The addition of white fillers increases the thermal stability, but to a much lesser degree. All these fillers decrease the frost resistance of vulcanisates. The coefficient of frost resistance at -45° lies between 0.28 to 0.32. Fillers also influence the resistance of the vulcanisates to ageing. Table 2: data on the chacteristic ageing of vulcanisates containing 30% channel black at 130 - 150°C; Fig.4: effect of the content of channel black on changes in the strength of vulcanisates during ageing at 150°C. It was also found that fillers such as lamp black, powdered silica gel and chalk do not affect the light and heat ageing of butyl rubber. Tests were

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also carried out on the effect of sunlight radiation on butyl rubber and on SKB rubber. Under analagous conditions, in SKB vulcanisates structural changes could be observed which showed themselves in a 30% increase in the strength, but a decrease of the relative elongation from 350 to 230%. When evaluating the effect of fillers on the ageing stability, the process of ozone destruction is also to be taken into account. A small quantity of carbon black (up to 5%) makes it possible to increase the time, at which rupture occurs, by 100% at 0.4% concentrations of ozone. Finely-dispersed white fillers also increase the resistance to ageing by ozone of the vulcanisates. The fillers also affect the properties of adhesion of the vulcanisates (Table 3). The bond strength of the fibres in butyl rubber is 2 to 3 times higher than in SKB. Adhesion is less affected by the addition of chalk, kaolin and gas and lamp black. The most effective hydrocarbon-containing fillers are gas black, followed by lamp black and the least effective is graphite. The same applies to polyamide and glass fibres. The adhesion can be increased by various addi-

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Butyl Rubber. Principles of Formulating Effective Compositions of Rubber Mixtures.

tives such as "Vulkacit B", the epoxide resin E-40 and butylphenol-formaldehyde resin No.101 (Table 4). The resin E-40 or 101 are most satisfactory for polyamide resins. Plasticisers, such as oleic acid, rosin and factice, play an important role in the distribution of the fillers, but these plasticisers tend to decrease the stability to gas diffusion and to aggressive media. Stearin and paraffin plasticisers have the least deleterious effect with respect to these properties. Anti-ageing agents are not so important for butyl rubber because of its high degree of saturation. Ordinary butyl rubber contains up to 0.5% Neozone D. Satisfactory results were obtained. Minimum increase in the modulus of the resins is observed in rubbers containing Neozone D together with nickel diethyldithiocarbamate. The author then deals with the preparation of butyl rubbers of various colouration, and gives the required quantities

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of pigments which are to be added to the mixtures. There are 4 Tables, 4 Figures and 6 References: 2 English and 4 Soviet.

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5(1,3) SOV/153-2-2-24/31

AUTHORS: Gul', V. Ye., Faynberg, R. Ya., Mayzel's, M. G., Rayevskiy, V. G.

TITLE: Physico-chemical Characteristics of the Interaction Processes of Polymer Materials With Solutions of High-molecular Compounds (Fiziko-khimicheskiye kharakteristiki protsessov vzaimodeystviya polimernykh materialov s rastvorami vysokomolekulyarnykh soyedineniy). II. On the Effect of the Nature of Textile Materials on Their Interaction With Rubber Glues (II. Vliyaniye prirody tekstil'nykh materialov na ikh vzaimodeystviye s rezinovymi kleyami)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya tekhnologiya, 1959, Vol 2, Nr 2, pp 270-273 (USSR)

ABSTRACT: The application of a rubber-glue-coating on a textile layer, during the production of rubber-impregnated textiles, forms a practical example for the interaction mentioned in the title. The total impression of the kinetic curves which characterize the change of the boundary-angle θ with the time, reflects the totality of the processes between the rubber-glue (= latex dissolved in petrol), which occur between this glue, and the textile base (Ref 1). The

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character of this interaction can be predicted, and the relative strength of their bonding can further be estimated from the degree and character of the change of the kinetic parameters θ and τ_{max}. In spite of the slight adhesion of several types of artificial fibres (polyamide-, glass-, viscose-fibres) in relation to the rubber coatings, the use of textile fibres on this base is often very appropriate. Their advantages are among others: high mechanical indices, resistance against aging, good rot-preventing properties. Apparently it is possible, by combining fibres of varying chemical nature, to produce textiles which have the required complex of technical properties. The following combined textiles were investigated: a) glass-cotton, b) glass-kapron, and c) glass-viscose fibre. The following compositions served as a glue: (parts by weight) rubber 100, sulphur 4, magnesium-oxide 5, neozone D 1 part. The wetting processes were estimated by direct measurement of the boundary angle on an

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enlarged photography of the drop (Ref 1). The τ_{max} values were determined on stationary sectors of the transformation curves of the wetting angle in connection with the time. On the basis of the results, the authors arrive at the following conclusions: 1) By building-up textile materials from fibres of various chemical nature, it is possible to alter the wetting-characteristics through rubber-glues in a required direction. 2) The introduction of cotton-fibres in textiles of synthetic or artificial fibres (glass-, polyamide-, viscose-, and other fibres) enables improving their wetting-property considerably (Figs 1-3). 3) The investigated textiles are placed in the following order, according to the reaction-intensity with rubber glues, as well as to the τ_{max} values: glass-cotton > glass-kapron > glass-viscose. For the τ_{max} value, this order is valid for all viscosity values. 4) For combined textiles or those which consist of a single type of fibre, the impregnation-spilling processes develop

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more intensively in a space saturated by the solvent. 5) The viscosity-increase of the glue slows down the processes mentioned under Nr 4. 6) The higher the glue-viscosity, the higher the range of the values of the wetting angle of the respective materials. 7) The τ_{max} value (the time interval within which the system textile-glue attains a quasi-equilibrium state) is determined by the nature of the fibre of the combined textile. There are 3 figures, 1 table, and 1 Soviet reference.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii i Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Moscow Institute of Fine Chemical Technology and Scientific Research Institute of the Rubber Industry)

SUBMITTED: March 15, 1958

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AUTHORS: Mayzel's, M.G., Rayevskiy, V.G.

TITLE: Methods of Increasing the Strength of Cohesion Between Rubber and Fabric in the Process of Calendering

PERIODICAL: Kauchuk i Rezina, 1960, No. 1, pp. 16 - 21

TEXT: In all articles made of fabric and rubber the strength of cohesion between the rubber cover and the textile carcass is of prime importance. The strength affects the resistance against abrasion and repeated deformations. The dependence of the stability of the bond between rubber and fabric on the temperature condition of calendering, i.e. the temperature, applied to the rubber mixture in the feeding space of the calender, ranging from 40 to 120°C. The temperature of the lower roller was kept constant at 60-65°C. The following rubberized fabrics were used: percale A, capron 1520 and glass fabric ASTTB; the following brands of rubber were employed: smoked sheets, synthetic polysoprene (SKI), butadiene (SKB-35) piperylene, butadiene nitrile (SKN-18, SKN-26, SKN-40), butadiene styrene (heat masticated rubbers SKS-30A, SKS-30, AM-33, ARM-15), carboxylate (SKS-30-1), methylvinyl-pyridine, butyl rubber B and nairit; in all cases lamp black was used

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as filler (25 weight parts to 100 weight parts of rubber). The thickness of the coating was 0.35 ± 0.002 mm. To increase the bond stability between rubber and fabric, some samples were soaked in 3% aqueous solution of epoxyamine resin No.89, a product of condensation of epichlorohydrine and metaphenylene-diamine. Graph 1 shows to what extent adhesion of natural rubber and synthetic rubber (polyisoprene) to fabric depends on the temperature during calendering. In the temperature range investigated natural rubber showed better adhesion than synthetic rubber. Between 90 and 100°C elasticity of rubber declines. Soaking the textile carcass in epoxy-amine resin considerably strengthens adhesion to fabric of both natural and synthetic rubbers. Graph 2 shows the degree of plasticity of the different rubber compounds; plasticity contributes to deeper penetration of rubber into the fabric. The strength of adhesion of piperylene rubber and SKB rubber to the textile carcass depends upon temperature during calendering (Graph 4). The same relationships are given for butyl rubber coating (Graph 5), SKS-30A, SKS-30-1, SKS-30, APM-15 and SKS-30 AM-33 (Graph 6), SKN rubbers (Graph 7), butadiene-methyl-vinyl-pyridine rubber (Graph 8). The article comments on the results of the tests as shown on the graphs and determines the best temperatures to be selected for each compound in the course of calendering,

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with due consideration of the chemical properties of each fabric. Generally speaking, the strength of adhesion improves with the increase of temperature in the course of calendering. All rubbers investigated adhere most stably to cotton fabrics, whereas the adhesion to chemical fibers is less strong. The article deals also with the effects of additional ingredients in rubber compounds, such as oil and epoxyamine resin, on plasto-elastic properties and adhesion. There are 8 graphs, 1 table and 13 references: 12 Soviet and 1 English.

ASSOCIATION: Nauchno issledovatel'skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry)

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AUTHORS: Mayzel's, M.G.(Deceased), Rayevskiy, V.G,

TITLE: The Formulation and Technology Characteristics of Applying Glass Fabrics and the Properties of Rubber-Fabric Materials Based on It

PERIODICAL: Kauchuk i rezina, 1960, No.12, pp. 18-24

TEXT: The article deals with the aspects of applying glass fabrics to rubberized materials. Glass fibers have the following advantages: high tear--resistance, high stability coefficient, low hygroscopicity, good dielectric properties, comparatively high stability against the action of chemicals, resistance against microorganisms and bacteria (Ref.1). The Soviet industry manufactures the following grades of glass fabrics: (Table 1), Э (E)electro--insulating (non-alkaline), A (A) aviation, AC (AS) special aviation, T (T) textolite (non-alkaline). The E and T grades are used for the production of rubberized materials, the thickness of the E-based material being 0.1 mm. The E-0.1 type of glass fabrics yields materials with a low weight and a sufficient mechanical stability. The adhesive material should be

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applied to the glass fabrics at a lower rate than that used in cotton fabrics (up to 12 - 14 m/min) using adhesive materials of lesser concentration due to the lower moistening ability of the glass fabrics with the rubber adhesive materials (Ref.4). The optimum concentrations of adhesives for the following rubbers are: CKC-30 (SKS)-1.0:2.5-1.0:3.0; SKS-30 APM-15 (ARM)-1.0:2.0--1.0:2.5; SKS-30-1.0:3.0-1.0:3.5; butyl rubber-1.0:1.7-1.0:2.2, nairite--1.0:2.0-1.0:2.5. Table 3 lists the optimum temperatures for lining glass fabrics with rubber based on various raw rubbers. The smearing rate of the glass fabrics can reach 35-40 m/min depending on the mixture composition. For vulcanization a minimum of moisture is recommended, since the latter and vapor have a negative effect on the mechanical properties of the glass fibers. Drumtype vulcanizers of the "Ber-torf" type with an electric heater should be used where the vulcanization is conducted at a temperature of 200°C if the glass fabrics materials must have a smooth surface and maximum stability of adhesion. The authors point out that it is necessary to thoroughly dry the glass fabric before applying the rubber coating. The removal of the lubricant

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must be the final operation of industrial manufacturing of glass fabrics. The optimum vulcanization of the rubber-fabric material is determined by the required degree of vulcanization of the rubber coating. An increase in the vulcanization period reduces the quality of the coating and the strength of adhesion to the glass fabrics. The most effective method for increasing the strength of adhesion is the modification of the rubber-fabric boundary layer by impregnating the fabric with adhesives. The effect of the impregnation of the glass fabrics with synthetic resins of various types on the adhesion was studied using: Methylolpolyamide (ПФЭ-2/10 - PFE-2/10), polyamide-epoxy (ПЭМ-2 - PEM-2), epoxy (Эд-5 - ED-5), epoxyamine (No.89), melamino-polyamide (ПФМ-12 - PFM-12) and urea-formaldehyde resin (МФФ -MFF). Table 4 shows that the type of rubber in the coating has a significant effect on the strength of adhesion with the glass fabrics. The strength of the rubber-fabric materials is determined by the corresponding characteristics of the glass fabrics. The technological process, the rubber composition and the type of raw rubber

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in the coating are to be taken into account. The mechanical properties of the rubberized material based on E-0.1 prior to vulcanization have the following values: Stability of the strip along the base and the weft - 65 kg /25-mm strip, tear resistance along the base - 7.8 kg, along the weft - 7.5 kg, elongation along the base - 4.2% and along the weft - 4.8 %. Materials based on glass fabrics are said to have a high aging resistance. By applying a coating of butyl rubber polymers, materials are obtained which can be used for lengthy periods at temperatures of 150 - 180°C. These materials have also a high stability under conditions of natural aging. Glass fabrics are stable to heat and light, but the combined action of these factors causes structural changes of the rubber. Glass fabric materials depend on the nature of the medium in which these materials are applied (Table 7). They are characterized by a low stability to repeated deformations which is explained by the high friction coefficient and the poor bond between the fibers. The durability in repeated deformations increases 3 - 4 times when a coating is applied. The greatest wear resistance is noted in materials

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covered with butadiene-nitrile, butadiene-styrene, carboxylic and methyl-vinylpyridine rubbers. The introduction of fillers in optimum quantities (carbon and powdered silica gel, graphite, titanium peroxide, talcum, etc.) raises this figure. A sharp increase in the wear resistance is also reached by using preliminary impregnation of the glass fabric with a solution of epoxyamine resin No.89. The gas permeability of the rubberized material depends on the bond of the elements which form it and the monolithic properties of the structure on the whole. The electro-conductivity of the glass fiber is increased by an increase in the alkaline metal oxide content. The non-alkaline type of glass fabrics has the best dielectric properties. The latter can be changed in the required direction by applying a rubber coating. For refractory rubberized materials made of glass fibers the proper selection of the rubber coating composition is important. The best results are achieved with coatings based on polychloroprene rubber containing antipyrenes in combination with fillers inert to the action of fire. Ammonium, borax, boracic acid, phosphoric acid, salts, etc., are

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used as the antipyrenes. For coatings applied on the glass fabrics antimony trioxide (3 - 10 w.p.) with chlorinated paraffin(5-10 w.p.) is recommended. Kaoline, aluminum hydroxide and talcum can be used as fillers. Refractory materials can be obtained by applying a nairite coating on glass fabrics containing a combination of antipyrene and kaoline. Glass fabrics increase the field of application of rubberized structural materials, especially in the production of articles with high mechanical indices, stability to aggressive media, heat, fire and with dielectric stability. There are 8 tables and 8 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry)

Table 1: The main characteristics of fabrics made of glass fibers. ① Grade of glass fiber; ② Thickness mm; ③ Weight of 1 m^2, g; ④ Density, number

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of threads to 1 cm; 5 Stability, kg 25-mm strip; 6 base; 7 weft; 8 base; 9 weft; 10 no more than.

1 *Основные характеристики тканей из стекловолокна*

Марка стекло-волокна (1)	Толщина, мм (2)	Вес 1 м², (3)	Плотность, количество нитей на 1 см (4)		Прочность, кг/полоску 25 мм (5) (не менее)	
			(6) основа	(7) уток	(8) основа	(9) уток
Э	0,06	68±7	20±1	20±1	25	20
Тс же	0,08	100±15	20±1	22±2	30	25
Same	0,1	105±15	20±1	22±2	30	30
А	—	Не более 80	17±1	20±1	28	20
АС	0,1	105±15	20±1	22±1	35	35
T_1	—	285±15	16±1	10±1	170	105
T_2	—	285±15	16±1	10±1	160	85

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Table 2: Lamination work of the adhesive film based on NR from glass and cotton fabrics. (1) Type of fabric; (2) Beer's Adhesion, g/cm; (3) Lamination work, erg/cm^2; (a) Glass fabric E-0.1; (b) Percal A.

(1) Вид ткани	(2) Сцепление по Беру, г/см	(3) Работа расслаивания, эрг/см^2
Стеклоткань (a) Э-0,1 . . .	175±15	(24,6±6)·10^4
Перкаль А . . (b)	250±7	(42,9±7)·10^4

Table 3: Optimum temperature conditions of covering glass fabrics on the calender. (1) Type of rubber in the coating; (2) Temperature of the calender rollers, °C; (3) Upper; (4) Middle; (5) Lower.

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Table 3 (continued)

3 Тип каучука в покрытии (1)	(2) Температура валков каландра, °С		
	верхний (3)	средний (4)	нижний 15
Смокед-шитс . .	100—120	85—95	65—80
СКИ	80—100	70—90	60—75
СКБ	70—85	65—75	50—70
Пшериленовый	75—85	60—70	50—60
СКС-30-А . . .	100—115	80—95	65—75
СКС-30АМ-33 .	65—75	60—70	45—55
СКС-30 АРМ-15	65—80	60—75	50—60
Бутилкаучук .	100—120	90—110	70—80
СКС-30-1 . . .	90—110	80—95	65—75
СКН-18	80—90	70—80	50—60
СКН-26	90—110	80—90	60—70
СКН-40	95—115	85—95	65—75
СКМВП-15 . .	85—100	75—85	60—70
Наирит	70—90	50—65	30—50

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Тип каучука в покрытии (1)	Прочность связи, кг/см (2)					
	Без пропитки (3)	Пропитка (4)				
		ПФЭ-2,10	ПЭМ-2	№ 89	ПФМ-12	МФФ
Каландированные материи (5)						
Смокед-шитс (a)	1,1	1,2	1,2	2,4	1,1	1,4
СКБ-35 (6)	0,3	0,6	0,7	2,5	0,9	0,8
Наирит	0,3	1,0	1,6	2,5	0,5	1,9
СКН-18	0,3	0,5	0,7	1,3	0,3	1,0
СКН-26	0,3	0,6	0,5	1,8	0,7	0,6
СКС-30-А	0,5	1,0	1,0	2,5	1,1	1,2
СКС-30-1	0,3	1,3	1,6	1,8	0,5	1,9
СКС-30 АРМ-15	1,2	1,9	1,7	2,2	1,7	1,8
СКС-30 АМ-33	0,4	0,8	0,8	1,5	0,9	0,7
СК МВП-15	0,5	1,2	1,5	2,3	1,6	1,4
Пипериленовый (c)	2,0	2,1	2,3	2,7	2,5	2,1
Шпредингованные материи (6)						
Смокед-шитс	1,0	—	—	2,2	—	—
СКБ-35	0,3	—	—	1,0	—	—
СКС-30А	0,5	—	—	2,1	—	—
СКС30 АМ-33	0,4	—	—	1,3	—	—
СКИ	0,8	—	—	1,9	—	—
СКС-30-1	0,4	—	—	1,0	—	—

Table 4: Effect of impregnating glass fabrics with synthetic resins on the strength of adhesion to the rubber coatings. (1) Type of rubber in the coating; (2) Strength of adhesion, kg/cm^2; (3) without impregnation; (4) impregnation; (5) calendered materials; (6) spread materials; (a) Smoked sheets; (b) nairite; (c) piperylene.

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